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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,859	12/28/2001	Alan Gatherer	TI-32753	7120
23494	7590	01/11/2005	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED			ABRAHAM, ESAW T	
P O BOX 655474, M/S 3999			ART UNIT	
DALLAS, TX 75265			PAPER NUMBER	
			2133	

DATE MAILED: 01/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/032,859

Applicant(s)

GATHERER ET AL.

Examiner

Esaw T Abraham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Final rejection

Response to the applicant's amendments

****Applicants argument with respect to original claims 1-7 filled in 09/20/04 have been fully considered but they are not persuasive. Therefore, the response in the first office action made on 05/19/04 stands active.

****The objection of record (disclosure, abstract and claim) is withdrawn in response to applicant's amendment.

Response to the applicant's argument

Applicant's argument of (09/20/04) has been fully considered, but is not deemed persuasive.

The applicant argues that Wang does not teach or there is no suggestion of cascaded MAP decoding. However, the examiner disagrees and although Wang et al. do not mention the word "cascading" in the invention, the practice of cascading is deemed to be inherent to Wang et al's decoder because by virtue of the fact the process of cascading "connecting an output of a device into an input of another device, which then may be in turn be connected to another device" is commonly employed by most of decoding systems including MAP decoders for arranging data in series or in succession of stages so that each stage derives from or acts upon product of the preceding. Therefore, the absence of the phrase "cascading architecture" as in claim 1 does not make the claims allowable since cascading architecture is analogous or similar to the MAP decoding of turbo coding of the prior art. Therefore, the applied references have been applied appropriately.

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The applicant further argues that Wang counts computations, not numbers of ACS units. The examiner disagrees since Wang teaches that the forward (alpha) and backward (beta) determined by series of multiplications (see expressions 17 and 18 of column 6 last paragraph and column 7 lines 1-42) and further figure 2b teaches LLR calculators (see fig. 2b, element 260) before they processed to extract extrinsic information that are sent to the other constituent decoder (see col. 8, lines 6-15). In response to the applicants' argument that the references fail to show certain features of applicants' invention, it is noted that the features upon which applicant relies are not recited in the rejected claim(s). For example, applicants' contend, the prior art does not teach or suggest "counting ACS" is non-claimed in the claimed language. Although, the claims interpreted in light of the specification, limitations from the specification are not read to the claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (U.S. PN: 6,606,725).

As per claim 1, Wang et al. teach or a matrix transform circuit and a method provides for MAP decoding of turbo codes whereby the method initializing a forward recursion probability function vector and a backward recursion probability function vector (see abstract). Further, Wang et al. teach an apparatus (Map decoder or turbo decoder) for decoding a turbo-encoded symbol sequence comprising the steps of a plurality of calculators for determining a plurality of transition probability matrices for each received symbol of the sequence, the plurality of probability matrices including a matrix; a first shift register, coupled to the plurality of calculators, configured to store values of a forward recursion probability function; a second shift register, coupled to the plurality of calculators, configured to store values of a backward recursion probability function vector, the second shift register linked by a second multiplier; and means for determining (output block) a log likelihood ratio for each decoded symbol in parallel after receiving the complete symbol sequence (see claims 5-7). Wang et al. **do not explicitly** teach cascade architecture. **However**, cascade architecture is known in the art of MAP decoding or iterative decoding. **Therefore**, it would have been obvious to a person having an ordinary skill in the art at the time the invention was made to include a cascade architecture for arranging data in series or in a succession of stages so that each stage derives from or acts upon the product of the preceding. **This modification** would have been obvious because a person having ordinary

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skill in the art would have been motivated in order to achieve higher coding gains and lower decoder complexities.

As per claim **2**, Wang et al. teach all the subject matter claimed in claim 1 including Wang et al. teach a plurality of calculators for determining a plurality of transition probability matrices for each received symbol of the sequence, the plurality of probability matrices including a matrix; a first shift register, coupled to the plurality of calculators (first and second ACS units), configured to store values of a forward recursion probability function vector; a second shift register, coupled to the plurality of calculators (third and fourth ACS units), configured to store values of a backward recursion probability function (see claim 5).

As per claim **3**, Wang et al. teach all the subject matter claimed in claim 1 including Wang et al. in figure 2b teach, the decoder (210) include calculators (260) comprising values temporarily be put in a storage elements (M) (250) below the corresponding calculators, before they further processed to extract extrinsic information that are sent to the other constituent decoder (see col. 8, lines 6-15).

As per claims **4 and 5**, Wang et al. teach the additional limitation of claim 4. The Map decoder of Wang et al. teaches table A below lists a comparison on the forward-backward recursion computations throughout successive M trellis states at arbitrary time k required by different methods (see col. 9, last paragraph and claim 2).

2. Claims **6 and 7** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yagyu (U.S. PN: 6,675,342) in view of Wang et al. (U.S. PN: 6,606,725).

As per claim **6**, Yagyu teach or disclose an iterative turbo decoding process utilizing comparison algorithm is implemented by dividing each iteration step into two stages wherein

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MAP-decoding is performed at each stage of the iteration step and the MAP-decoding produces information sequences at each stage that are then subsequently summed and quantized into binary (see col. 3, lines 27-33). Further, Yagyu in figure 1 disclose a first MAP decoder (106) receiving data and extrinsic information sequence(k), a first interleaver (112) coupled to the first MAP, a second interleaver (130) coupled to input X(k) for receiving symbols, a second MAP decoder (114) coupled to the first and second interleavers, a deinterleaver coupled to an output of said second MAP and a decision unit coupled to inputs of receiving symbols and output of first MAP decoder (see elements 118,124 and col. 6, lines 5-34). Yagyu **does not explicitly teach** that the first and second MAP decoders each include a forward and backward recursion blocks. **However**, Wang et al. teach a method of MAP decoding of turbo codes whereby the method initializing a forward recursion probability function vector and a backward recursion probability function vector (see abstract). Further, Wang et al. teach an apparatus (Map decoder or turbo decoder) for decoding a turbo-encoded symbol sequence comprising a plurality of transition probability matrices including a matrix; a first shift register, configured to store values of a forward recursion probability function; a second shift register, configured to store values of a backward recursion probability function vector, the second shift register linked by a second multiplier; and means for determining (output block) a log likelihood ratio for each decoded symbol in parallel after receiving the complete symbol sequence (see claims 5-7). **Therefore**, it would have been obvious to a person having an ordinary skill in the art at the time the invention was made to implement the teachings of Yagyu including forward recursion and backward recursion operations as taught by Wang et al. **This modification** would have been

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obvious because a person having ordinary skill in the art would have been motivated in order to reduce memory capacity and simplify the complicated data accesses (see col. 10, lines 20-26).

As per claim 7, Yagyu in view of Wang et al. teach all the subject matter claimed in claim 6 including Yagyu in figure 1 disclosed the output of the deinterleaver (see the interleaver coupled to the element 116) coupled to the extrinsic information of first MAP decoder (see element 106 and L extrinsic (k)).

3. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US PN: 6,477,681 Taipale et al.

US PN: 6,400,290 Langhammer et al.

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4. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Esaw Abraham whose telephone number is (703) 305-7743. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are successful, the examiner's supervisor, Albert DeCady can be reached on (703) 305-9595. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Esaw Abraham

Esaw Abraham

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Albert DeCady
ALBERT DECADY
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100